



## TEST REPORT

**Application No.....:** S20230417894001

**Applicant's name....:** Lumi United Technology Co., Ltd

**Applicant's address:** Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

**Sample description:** Dual Relay Module T2

**Model.....:** DCM-K01

**Date of receipt of test** 2023-04-13

**Test location.....:** G9 building, China Sensor Network International innovation Park, No.200, Linghu Ave, new district of Wuxi,China

**Test standard.....:** ETSI EN 300 328 V2.2.2 (2019-07)

**Test date(s).....:** 2023-05-16

**Test result.....:** The test results are in compliance with the above mentioned standards.

**Date of issue.....:** 2023-07-14

**Compiled by:**

Qianlan Sang

**Reviewed by:**

Amos Xia

**Approved by:**

Line Chen

*Qianlan Sang*

*Amos Xia*

*Line Chen*



**Other aspects:** N/A

**Abbreviations:** P = passed; F = failed; N/A = not applicable

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<b>Test item description :</b>	Dual Relay Module T2
<b>Trade mark.....:</b>	Aqara
<b>Manufacturer.....:</b>	Lumi United Technology Co., Ltd
<b>Manufacturer's address.....:</b>	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
<b>Factory.....:</b>	/
<b>Factory's address.....:</b>	/
<b>Ratings.....:</b>	Input: 100-250 VAC,10A

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## 1. General Information

### 1.1. Testing Facility

Test Site
Fangguang Inspection & Testing Co., Ltd.
Test Site Location
G9 building, China Sensor Network International innovation Park, No.200, Linghu Ave, new district of Wuxi,China

### 1.2. Feature of Equipment under Test

Product Name	Dual Relay Module T2
Model No.	DCM-K01
Hardware Version	x4
Software Version	0.0.0_0023

### 1.3. Product Specification Subjective to this Report

Frequency Range	2405-2475 MHz
Number of Channels	Zigbee: 15
Channel Spacing	Zigbee: 5MHz
Antenna Gain	1dBi
Type of Modulation	Zigbee: O-QPSK

Note: For other features of this EUT, test report will be issued separately.

### 1.4. Working Frequencies for this Report

Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405 MHz	12	2410 MHz	13	2415 MHz
14	2420 MHz	15	2425 MHz	16	2430 MHz
17	2435 MHz	18	2440 MHz	19	2445 MHz
20	2450 MHz	21	2455 MHz	22	2460 MHz
23	2465 MHz	24	2470 MHz	25	2475 MHz

### 1.5. Application Form for Testing

Modulation Type		
<input type="checkbox"/>	FHSS	<input checked="" type="checkbox"/> other forms of modulation
Adaptivity Equipment		
<input checked="" type="checkbox"/>	Non-Adaptive Equipment: The maximum RF Output Power (e.i.r.p.): 9.47dBm The maximum (corresponding) Duty Cycle: ... %	
	Adaptive Equipment without the possibility to switch to a non-adaptive mode:	
<input type="checkbox"/>	<input type="checkbox"/> The equipment has implemented an LBT based DAA mechanism: <ul style="list-style-type: none"> <li>● In case of equipment using modulation different from FHSS:</li> </ul> <input type="checkbox"/> The equipment is Frame Based equipment	
	<input type="checkbox"/> The equipment is Load Based equipment	
	<input type="checkbox"/> The equipment can switch dynamically between Frame Based and Load Based equipment	
	<input type="checkbox"/> The equipment has implemented an non-LBT based DAA mechanism	
	<input type="checkbox"/> The equipment can operate in more than one adaptive mode	
	<input type="checkbox"/> Adaptive Equipment which can also operate in a non-adaptive mode	
Antenna Category		
<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)	
	<input type="checkbox"/> Temporary RF connector provided	
	<input checked="" type="checkbox"/> No temporary RF connector provided	
Device Type		
<input checked="" type="checkbox"/>	Stand-alone	
	<input type="checkbox"/> Combined (or host) equipment	
	<input type="checkbox"/> Plug-in radio device	
	<input type="checkbox"/> Test Jig	
Operating Conditions		
<input checked="" type="checkbox"/>	AC Mains	<input type="checkbox"/>
	AC Voltage Range: 100-250 VAC	DC
Type of DC Source	<input type="checkbox"/> Internal DC supply	
	<input type="checkbox"/> External DC adapter	
	<input type="checkbox"/> Battery	
<input checked="" type="checkbox"/>	Temperature Range: -10 ~ 40°C	



Geo-location Capability Supported by the Equipment	
<input type="checkbox"/>	Yes <input type="checkbox"/> The geographical location determined by the equipment is not accessible to the user.
<input checked="" type="checkbox"/>	No

## 1.6. Standards Applicable for Testing

The EUT complies with the requirements of ETSI EN 300328 V2.2.2.

## 2. Test Configuration of Equipment under Test

### 2.1. Test Mode

Test Mode
Mode 1: Transmit by Zigbee
Mode 2: Receive by Zigbee

### 2.2. Test Software

Software Version	Test Level
QCOM_V1.0	Default value

### 3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 1.28dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 2.72dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 30MHz-1GHz: 1.00 dB 1GHz-12.75GHz: 1.30 dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 0.60dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 0.80dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 0.20MHz

This uncertainty represents an expanded uncertainty factor of  $k=2$ .

#### 4. Test Summary

Clause (EN 300328)	Test Item	Result (Pass/Fail)	Remark
<b>Transmitter Parameter</b>			
4.3.1.2	RF Output Power	Pass	--
4.3.2.2			
4.3.2.3	Maximum Equivalent Isotropically Radiated Power (E.I.R.P.) Spectral Density	Pass	--
4.3.1.4			Only applicable for equipment using FHSS modulation
4.3.1.5	Hopping Frequency Requirements	N/A	
4.3.1.8	Occupied Channel Bandwidth	Pass	--
4.3.2.7			
4.3.1.9	Transmitter unwanted emissions in the out-of-band domain	Pass	--
4.3.2.8			
4.3.1.10	Transmitter unwanted emissions in the spurious domain	Pass	--
4.3.2.9			
<b>Receiver Parameters</b>			
4.3.1.11	Receiver Spurious Emissions	Pass	--
4.3.1.12	Receiver Blocking	Pass	--
<b>Adaptive Test Item</b>			
4.3.1.7	Adaptivity	N/A	Only applicable for adaptive equipment Output Power >10dBm
<b>Non-Adaptive Test Item</b>			
4.3.1.3	Duty Cycle, Tx-Sequence, Tx-gap	N/A	Only applicable for non-adaptive equipment Output Power >10dBm
4.3.1.6	Medium Utilisation (MU) Factor	N/A	
<b>Geo-location Mechanism</b>			
4.3.2.12	Geo-Location Capability	N/A	This device doesn't have Geo-location Capability.
Note:/			

## 5. RF Output Power

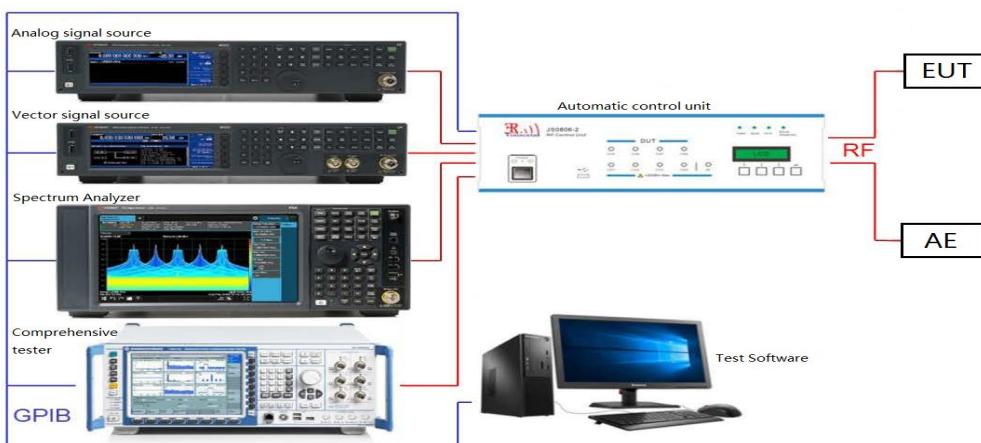
### 5.1. Limit

The maximum RF output power for non-adaptive equipment shall be declared by the manufacturer and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the manufacturer.

Test Conditions	Limit
Normal and Extreme Temperature Conditions	20dBm (E.I.R.P)

### 5.2. Test Setup

#### For Conducted Measurement



### 5.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2 (2019-07) Clause 5.4.2.2.1.

#### 5.4. Test Result

Product	Dual Relay Module T2	Temperature	-10 ~ 40°C
Test Engineer	Amos Xia	Relative Humidity	50 ~ 54%
Test Site	FGTEST	Test Date	2023/05/16

Test Condition	Test Mode	Channel	EIRP[dBm]	Limit[dBm]	Verdict
NTNV	ZIGB	2405	9.47	20	PASS
		2440	8.87	20	PASS
		2475	8.56	20	PASS
LTNV	ZIGB	2405	9.11	20	PASS
		2440	8.54	20	PASS
		2475	8.78	20	PASS
HTNV	ZIGB	2405	9.23	20	PASS
		2440	8.48	20	PASS
		2475	8.39	20	PASS

Note:

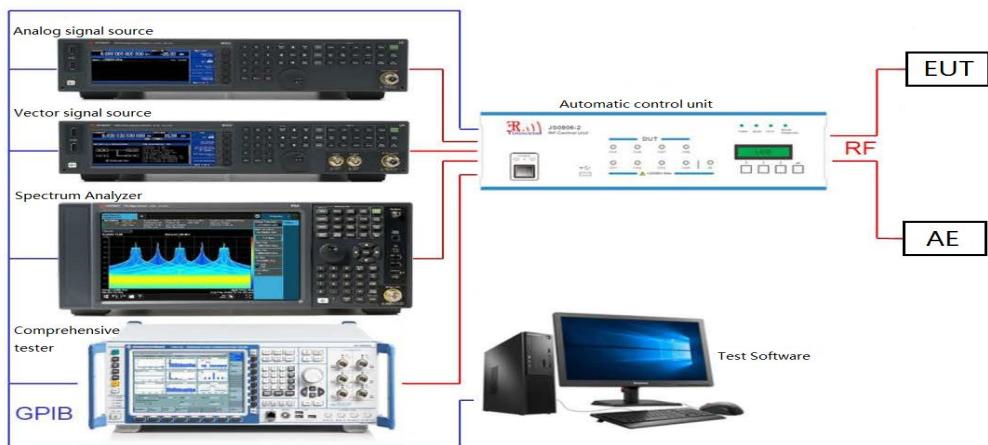
1. Max EIRP Power (dBm) = Average Power (dBm) + Antenna Gain (dBi).
2. The measurement duration shall be long enough to ensure a minimum number of 10 bursts are captured.

## 6. Power Spectral Density

### 6.1. Limit

The maximum Power Spectral Density is limited to 10dBm per MHz for equipment using wide band modulations other than FHSS.

### 6.2. Test Setup



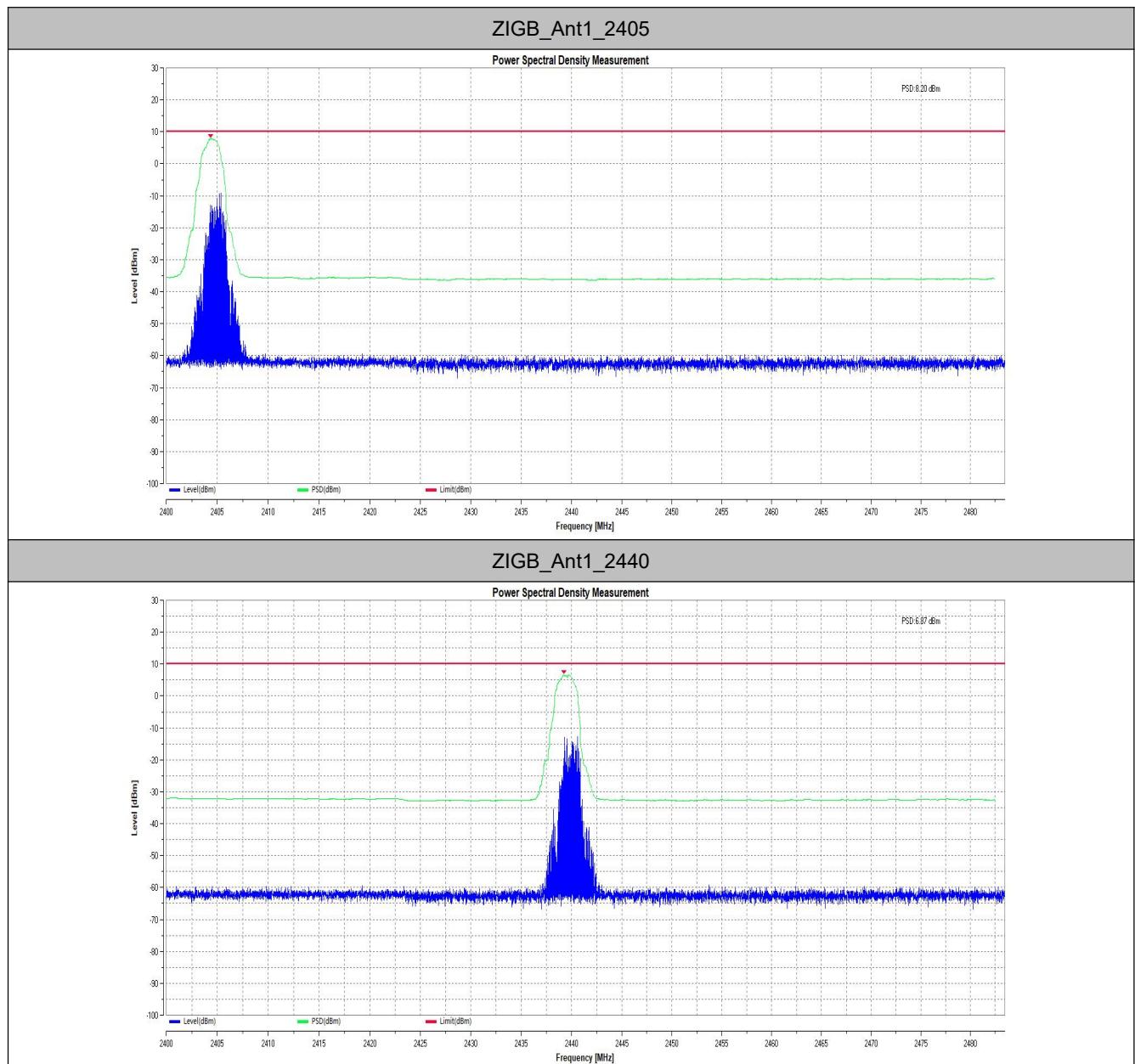
### 6.3. Test Procedure

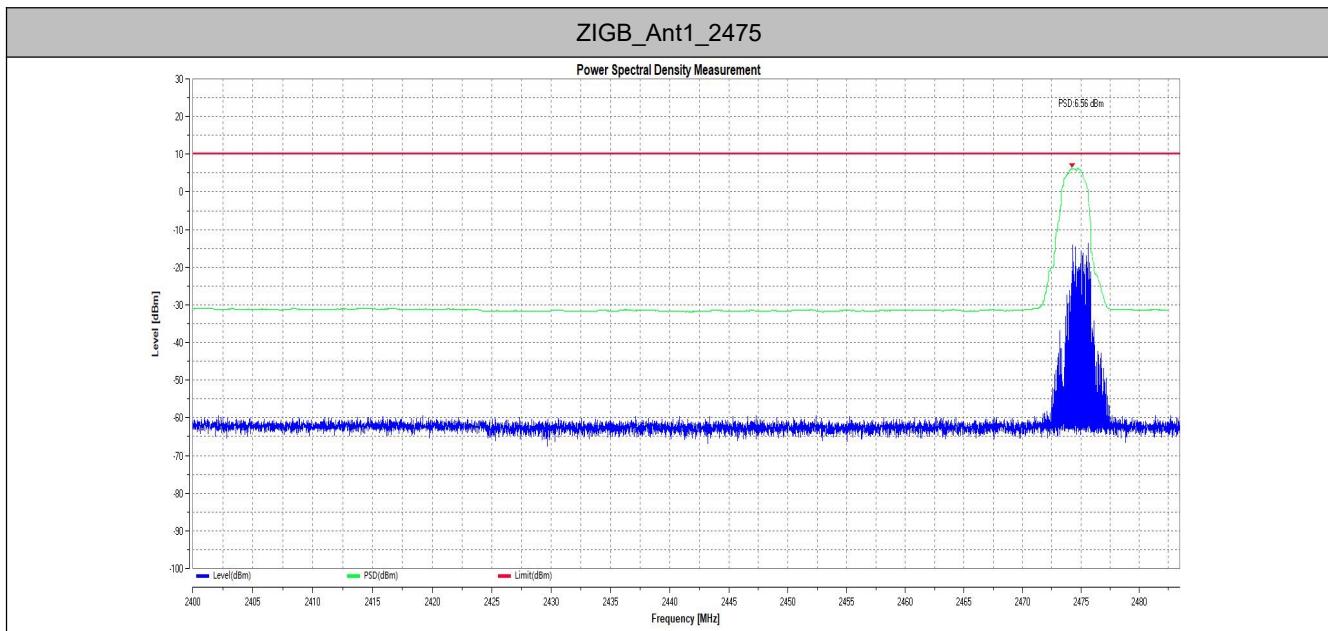
Refer to ETSI EN300 328 V2.2.2 (2019-07) Clause 5.4.3.2.1.

## 6.4. Test Result

Product	Dual Relay Module T2	Temperature	25°C
Test Engineer	Amos Xia	Relative Humidity	54%
Test Site	FGTEST	Test Date	2023/05/16

Test Mode	Channel	PSD[dBm/MHz]	Limit[dBm/MHz]	Verdict
ZIGB	2405	8.20	10	PASS
	2440	6.87	10	PASS
	2475	6.56	10	PASS



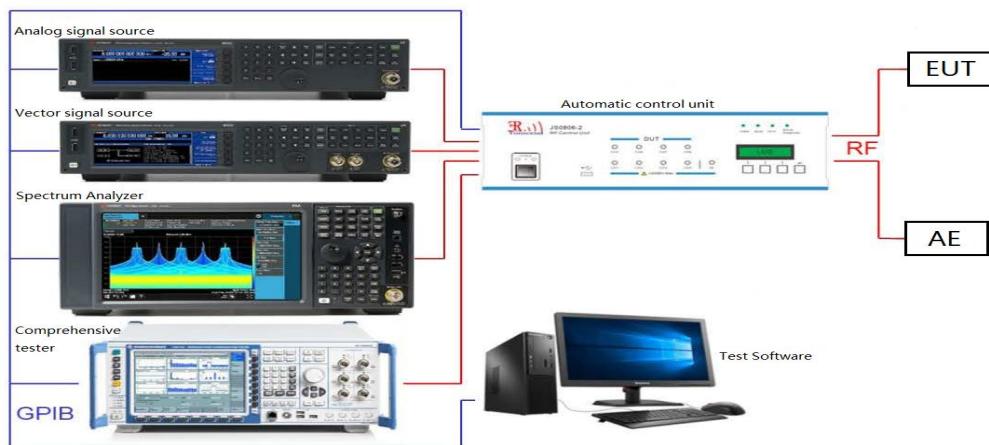


## 7. Occupied Channel Bandwidth

### 7.1. Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band given in 2.4GHz to 2.4835GHz.

### 7.2. Test Setup



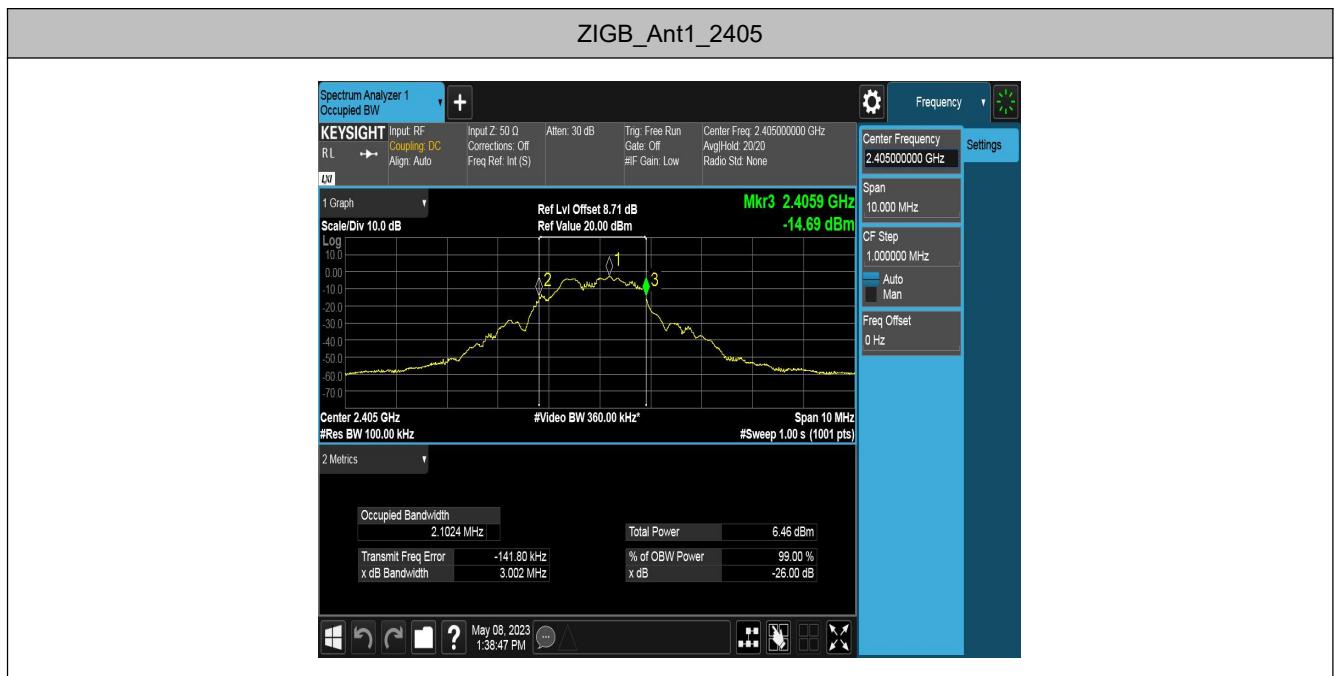
### 7.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2 (2019-07) Clause 5.4.7.2.1

## 7.4. Test Result

Product	Dual Relay Module T2		Temperature	25°C
Test Engineer	Amos Xia		Relative Humidity	52%
Test Site	FGTEST		Test Date	2023/05/16

Test Mode	Channel	OCB[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
ZIGB	2405	2.1024	2403.8070	2405.9094	2400 to 2483.5	PASS
	2440	2.1178	2438.7915	2440.9093	2400 to 2483.5	PASS
	2475	2.1221	2473.7857	2475.9078	2400 to 2483.5	PASS

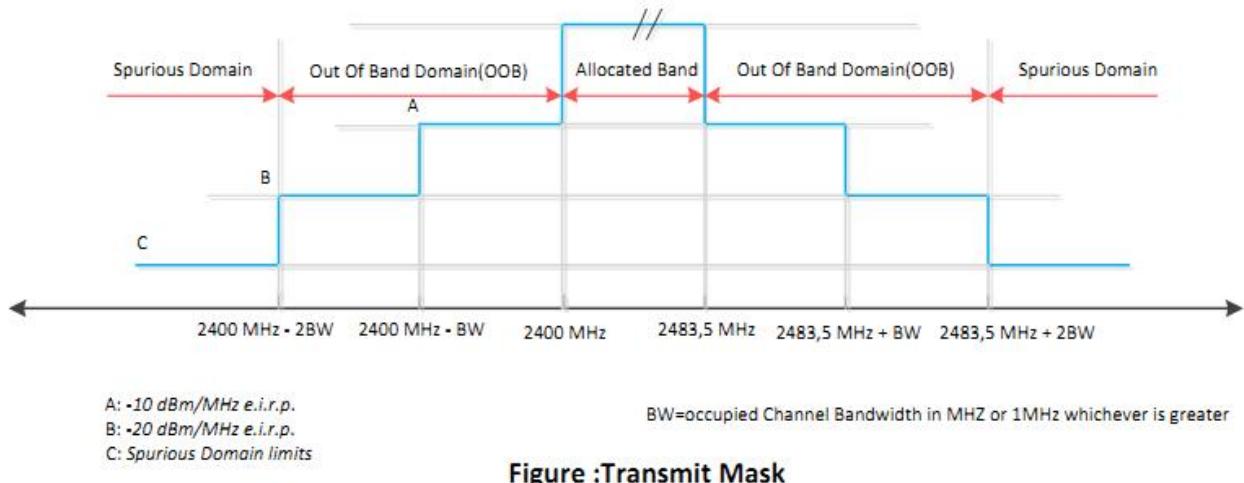




## 8. Transmitter Unwanted Emissions in the Out-of-Band Domain

### 8.1. Limit

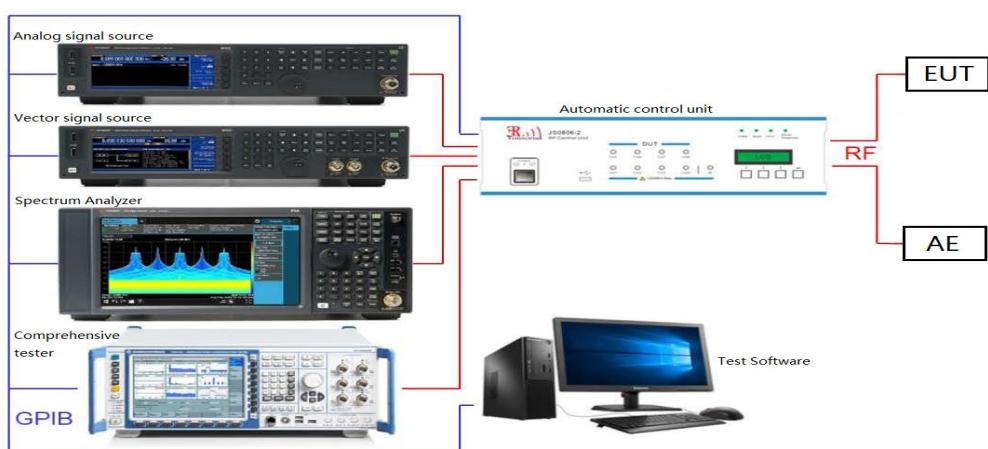
The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure as below.



**Figure :Transmit Mask**

### 8.2. Test Setup

#### For Conducted Measurement



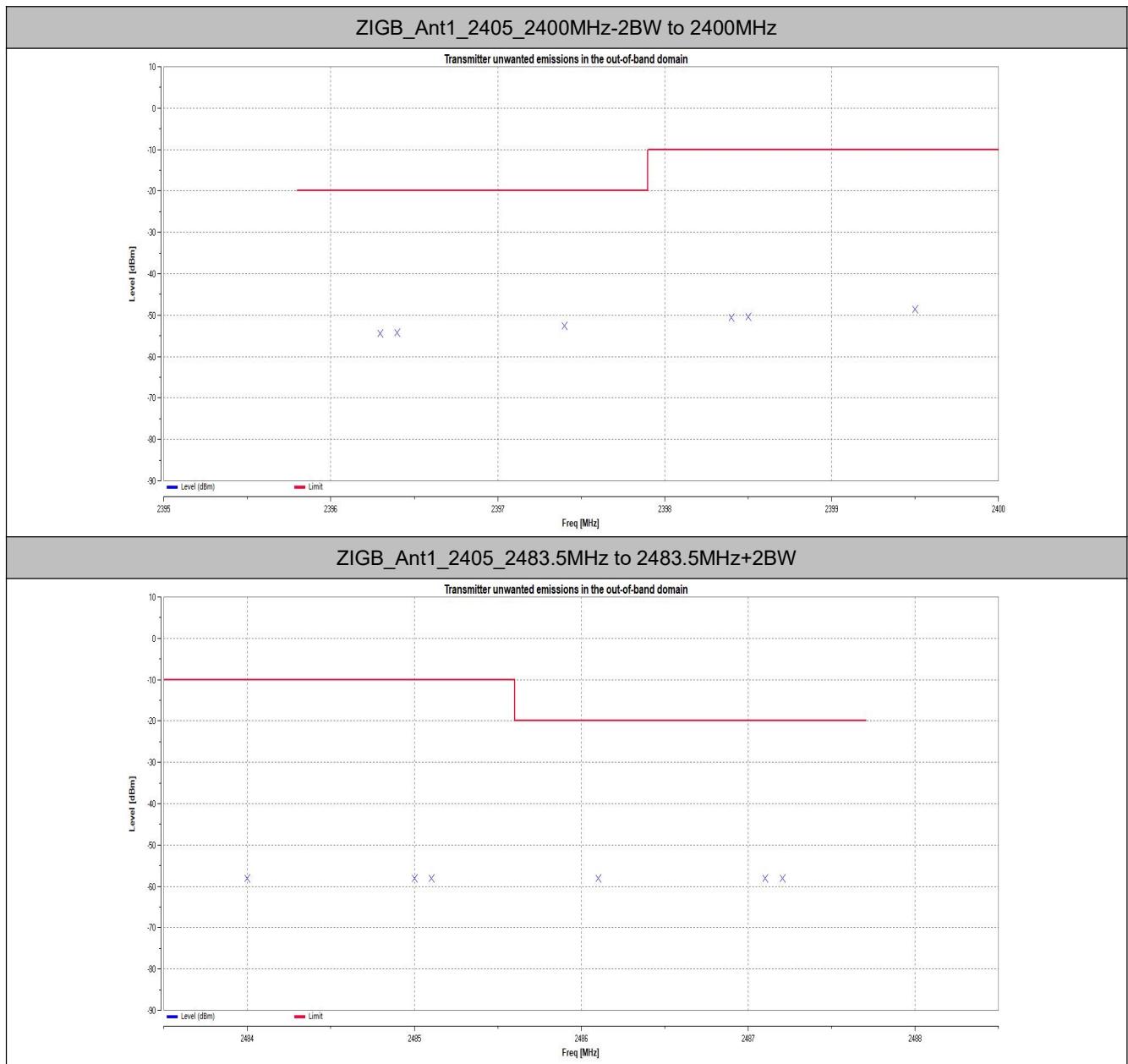
### 8.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2 (2019-07) Clause 5.4.8.2.1

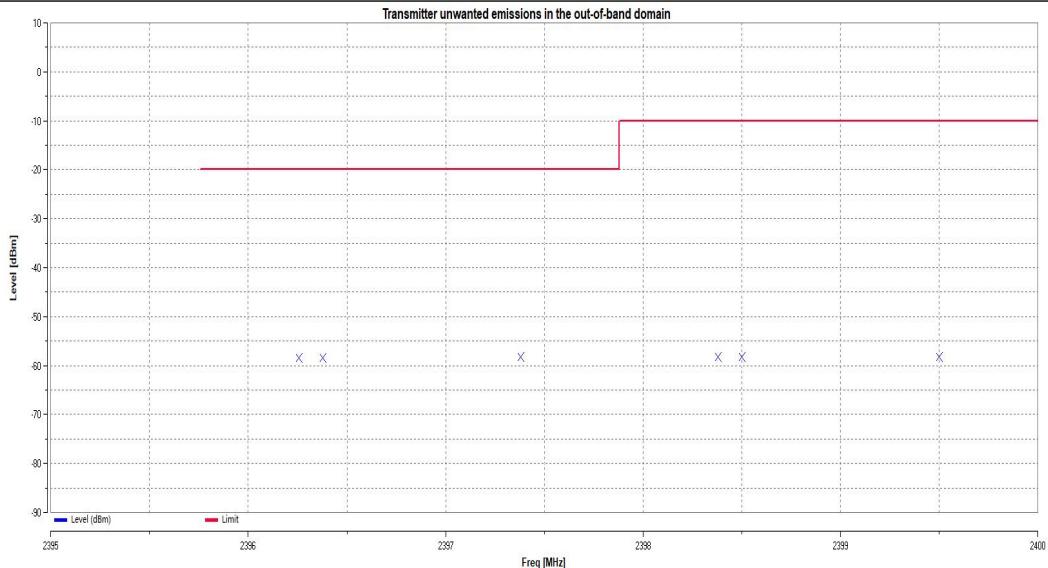
#### 8.4. Test Result

Product	Dual Relay Module T2	Temperature	25°C
Test Engineer	Amos Xia	Relative Humidity	54%
Test Site	FGTEST	Test Date	2023/05/16

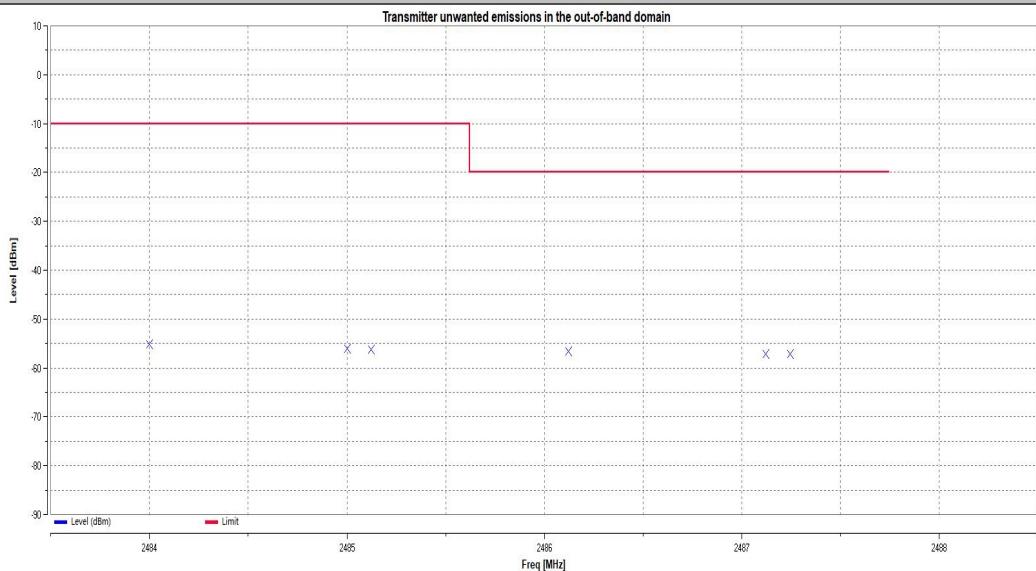
TestMode	Channel	Freq. [MHz]	Level[dBm]	Limit[dBm]	Verdict
ZIGB	2405	2396.2952	-54.39	-20.00	PASS
		2396.3976	-54.26	-20.00	PASS
		2397.3976	-52.53	-20.00	PASS
		2398.3976	-50.59	-10.00	PASS
		2398.5000	-50.38	-10.00	PASS
		2399.5000	-48.57	-10.00	PASS
		2484.0000	-58.06	-10.00	PASS
		2485.0000	-58.09	-10.00	PASS
		2485.1024	-58.08	-10.00	PASS
		2486.1024	-58.08	-20.00	PASS
		2487.1024	-58.07	-20.00	PASS
		2487.2048	-58.07	-20.00	PASS
ZIGB	2475	2396.2558	-58.37	-20.00	PASS
		2396.3779	-58.34	-20.00	PASS
		2397.3779	-58.30	-20.00	PASS
		2398.3779	-58.20	-10.00	PASS
		2398.5000	-58.19	-10.00	PASS
		2399.5000	-58.33	-10.00	PASS
		2484.0000	-55.09	-10.00	PASS
		2485.0000	-56.09	-10.00	PASS
		2485.1221	-56.23	-10.00	PASS
		2486.1221	-56.69	-20.00	PASS
		2487.1221	-57.17	-20.00	PASS
		2487.2442	-57.24	-20.00	PASS



ZIGB\_Ant1\_2475\_2400MHz-2BW to 2400MHz



ZIGB\_Ant1\_2475\_2483.5MHz to 2483.5MHz+2BW



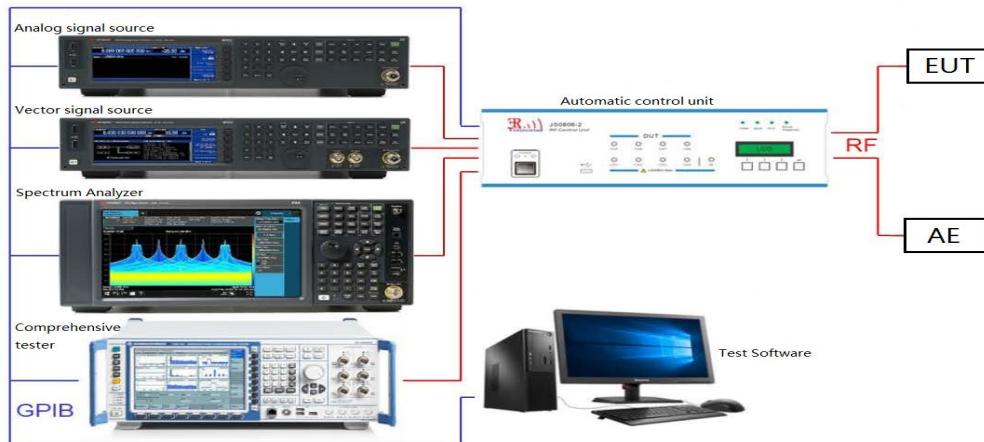
## 9. Transmitter Unwanted Emissions in the Spurious Domain

### 9.1. Limit

Transmitter Limits for Spurious Emissions		
Frequency Range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87,5 MHz	-36dBm	100 kHz
87,5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 862 MHz	-54dBm	100 kHz
862 MHz to 1 GHz	-36dBm	100 kHz
1 GHz to 12,75 GHz	-30dBm	1 MHz

### 9.2. Test Setup

#### For Conducted Measurement



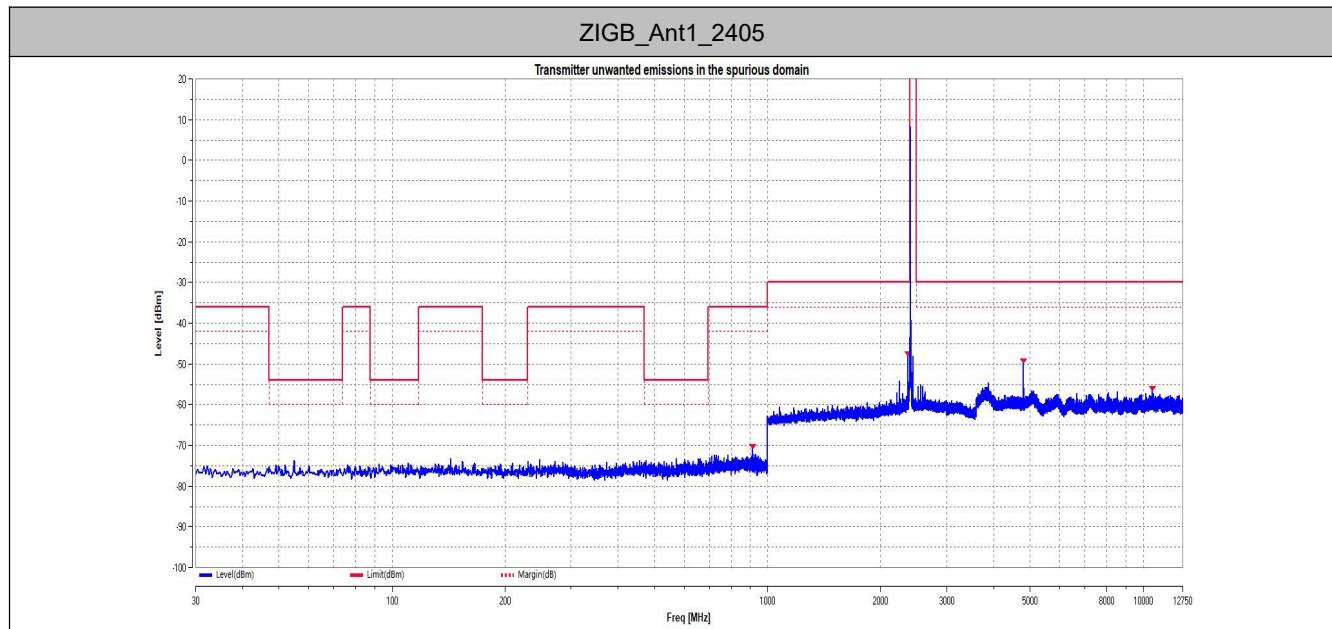
### 9.3. Test Procedure

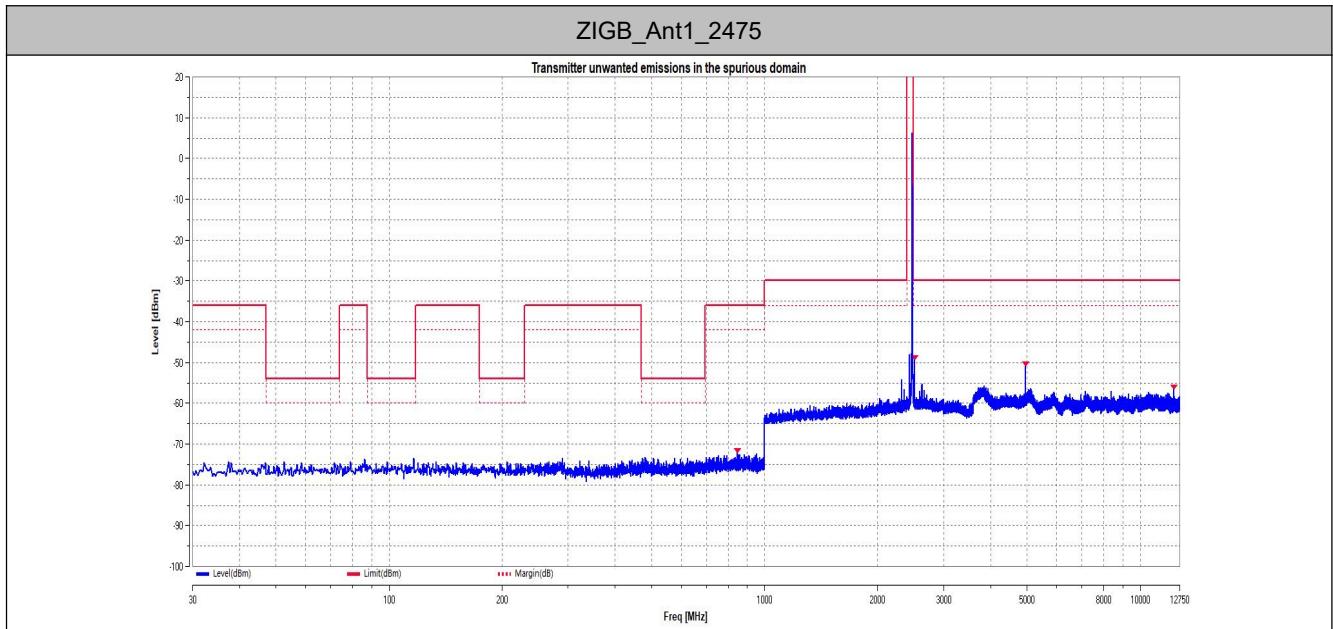
Refer to ETSI EN 300 328 V2.2.2 (2019-07) Clause 5.4.9.2.1

#### 9.4. Test Result

Product	Dual Relay Module T2	Temperature	25°C
Test Engineer	Amos Xia	Relative Humidity	54%
Test Site	FGTEST	Test Date	2023/05/16

TestMode	Antenna	Freq(MHz)	Freq. [MHz]	Level[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	2405	913.35	-70.84	-36	PASS
			2367.00	-48.19	-30	PASS
			4809.90	-49.93	-30	PASS
			10579.14	-56.66	-30	PASS
		2475	845.45	-72.14	-36	PASS
			2514.00	-49.33	-30	PASS
			4950.90	-50.91	-30	PASS
			12318.00	-56.72	-30	PASS



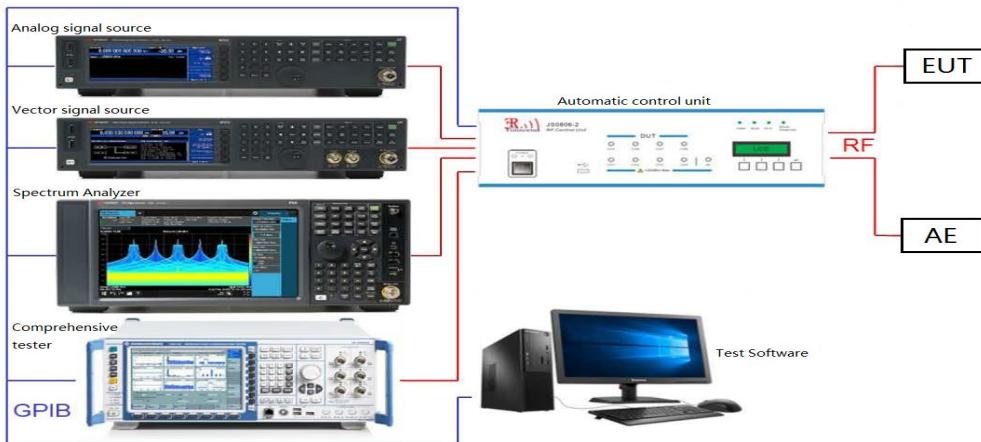


## 10. Receiver Spurious Emissions

### 10.1. Limit

Spurious Emissions Limits for Receivers		
Frequency Range	Maximum Power	Measurement Bandwidth
30 MHz to 1 GHz	-57dBm	100 kHz
1 GHz to 12.75 GHz	-47dBm	1 MHz

### 10.2. Test Setup

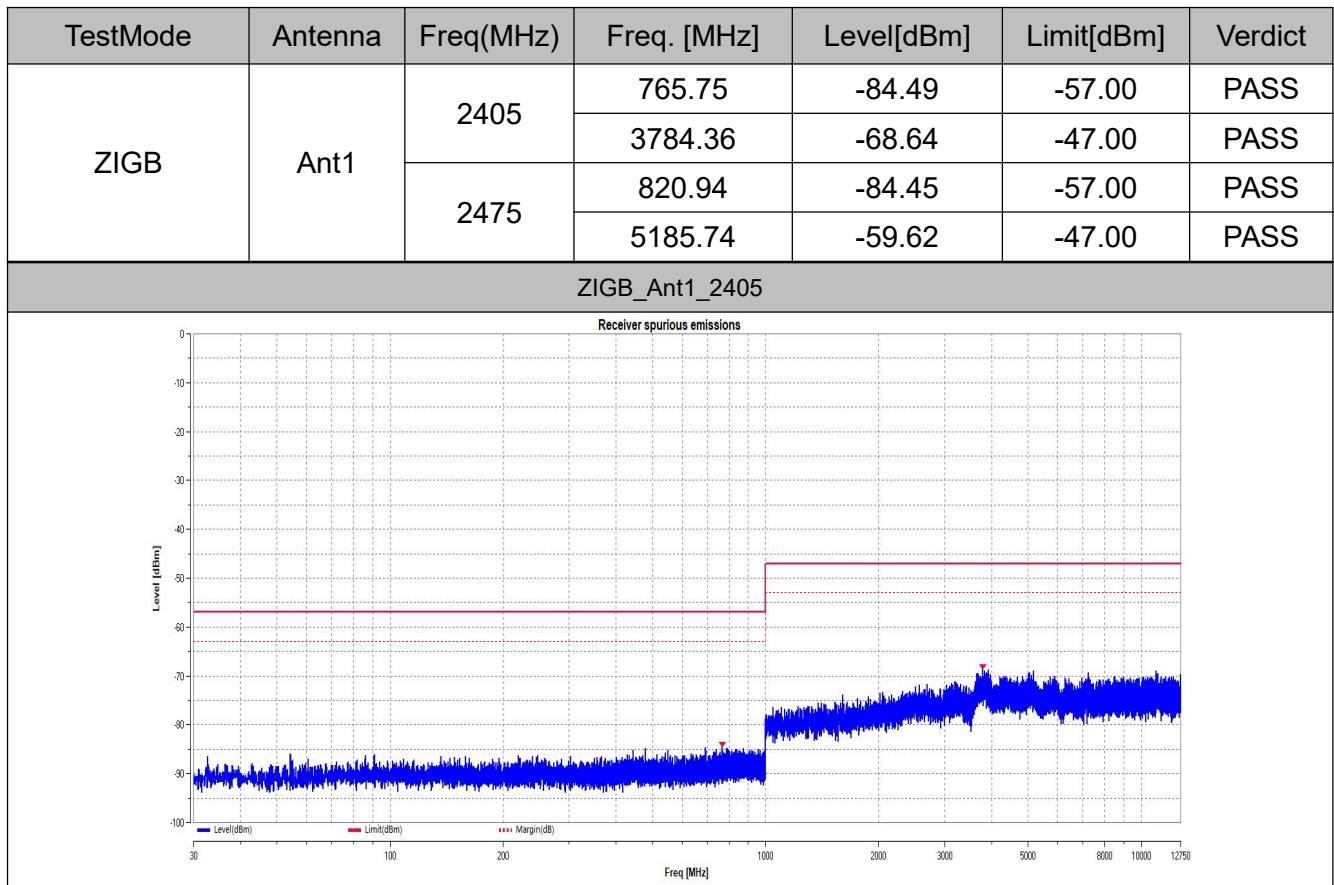


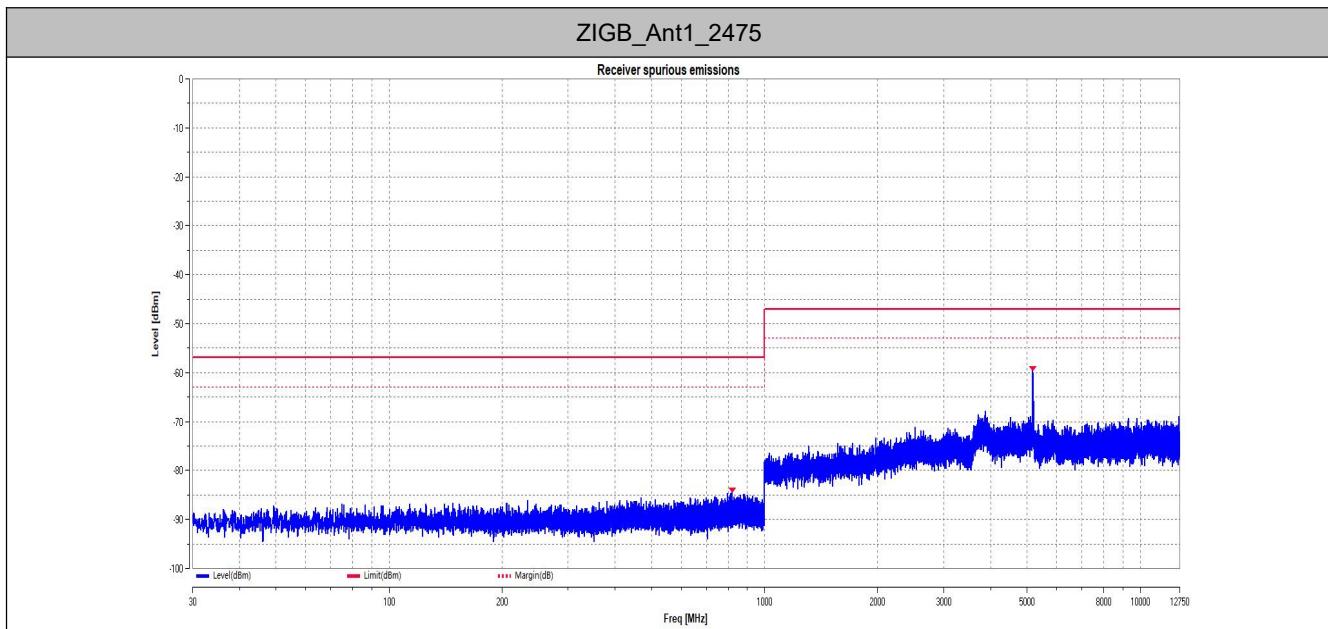
### 10.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2 (2019-07) Clause 5.4.10.2.1

#### 10.4. Test Result

Product	Dual Relay Module T2	Temperature	25°C
Test Engineer	Amos Xia	Relative Humidity	54%
Test Site	FGTEST	Test Date	2023/05/16





## 11. Receiver Blocking

### 11.1. Limit

The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment.

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
(-139 dBm+10×log10(OCBW) +10 dB) or (-74 dBm+10 dB) whichever is less (see note 2)	2 380	-34	CW
	2 504		
	2 300		
	2 584		

Note 1: OCBW is in Hz.

Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to  $P_{min} + 26$  dB where  $P_{min}$  is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

## 11.2. Test Setup

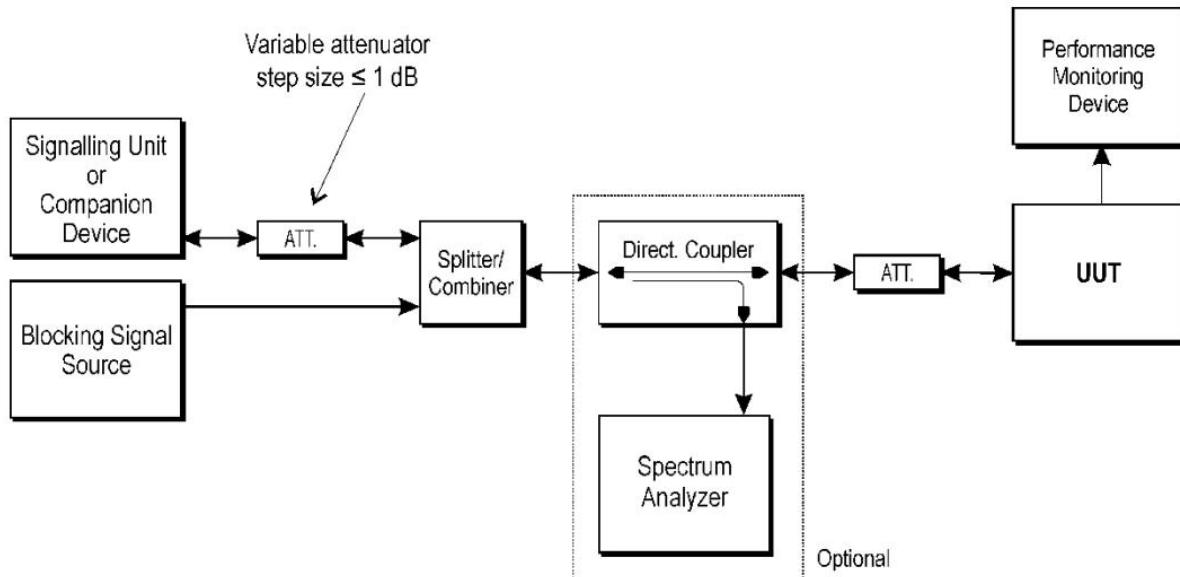


Figure 6: Test Set-up for receiver blocking

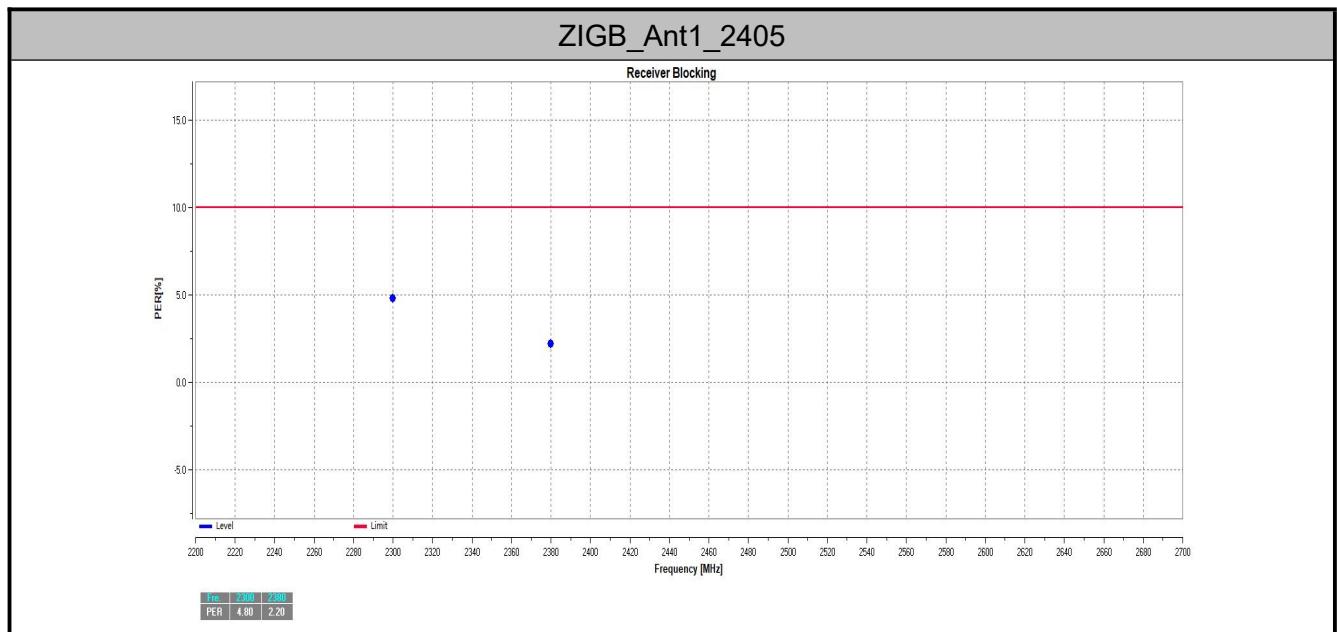
## 11.3. Test Procedure

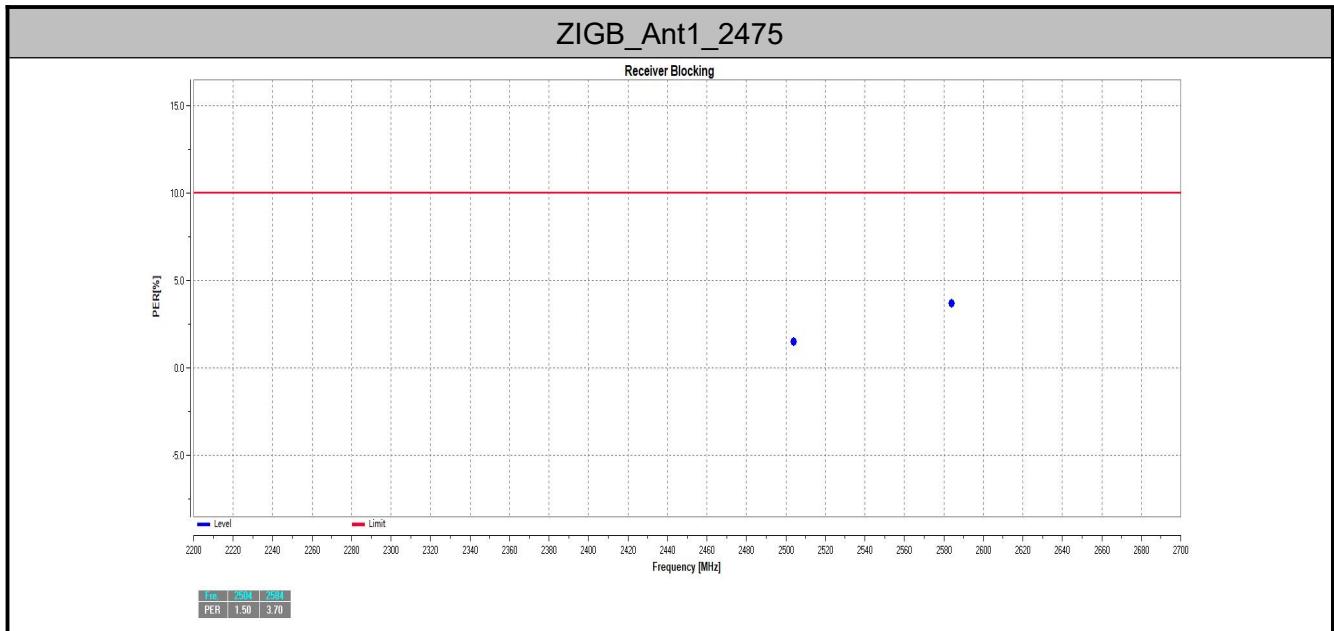
Refer to ETSI EN 300 328 V2.2.2 (2019-07) Clause 5.4.11.2.1.

### 11.4. Test Result

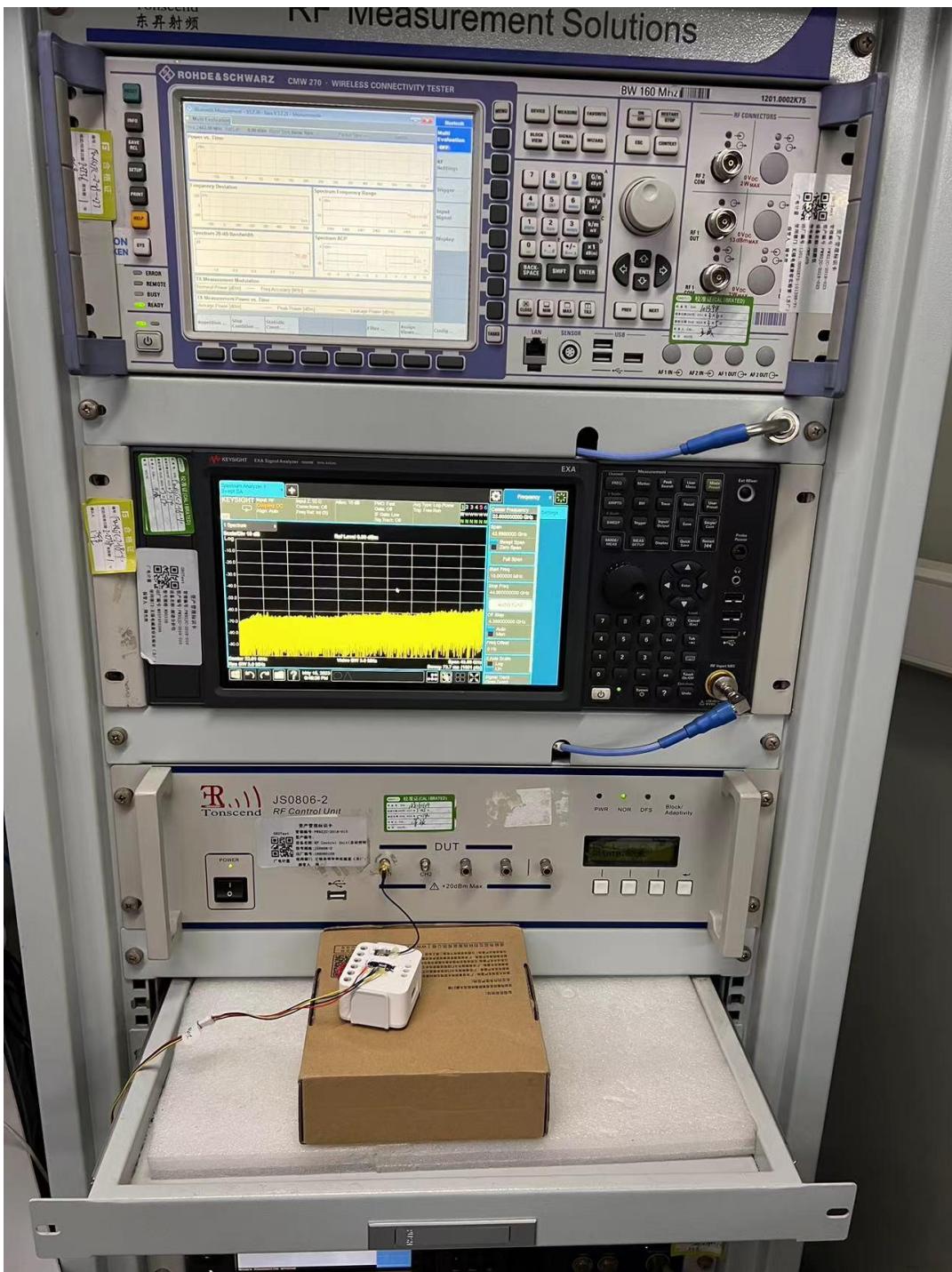
Product	Dual Relay Module T2	Temperature	25°C
Test Engineer	Amos Xia	Relative Humidity	54%
Test Site	FGTEST	Test Date	2023/05/16
Test Mode	ZIGB		

TestMode	Antenna	Freq(MHz)	Wanted signal [dBm]	Freq. [MHz]	CW [dBm]	PER [%]	Limit [%]	Verdict
ZIGB	Ant1	2405	-64.77	2300	-33	4.80	≤10	PASS
			-64.77	2380	-33	2.20	≤10	PASS
		2475	-64.73	2504	-33	1.50	≤10	PASS
			-64.73	2584	-33	3.70	≤10	PASS





## 12. Test Photograph



### 13. List of Measuring Instrument

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Keysight	N9010B	FWXGJC-2018-010	1 year	2024/03/13
RF Control Unit	Toncend	JS0806-2	FWXGJC-2018-013	1 year	2024/05/14
Signal Generator	Keysight	N5182B	FWXGJC-2018-011	1 year	2024/03/13
Signal Generator	Keysight	N5171B	FWXGJC-2018-012	1 year	2024/03/13
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2024/03/21

Test Software	Manufacturer	Version	Asset No.	Function
RF Test Software	Tonscend	3.2.22	/	/

## 14. Appendix - EUT Photograph

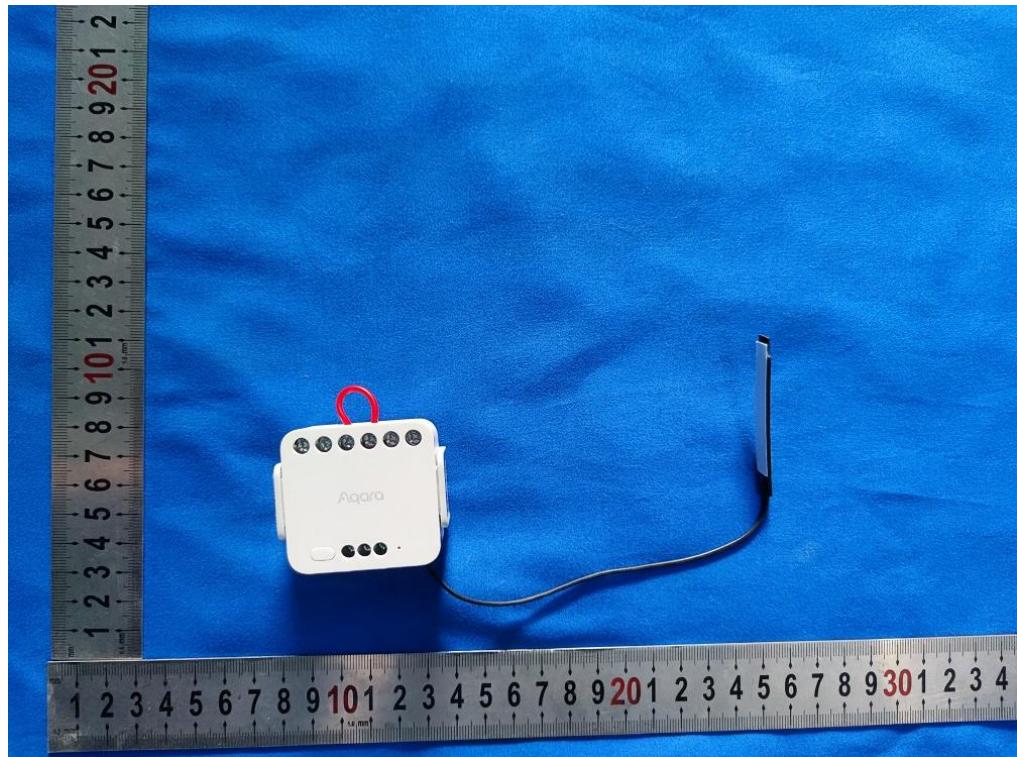


Photo 1: General view

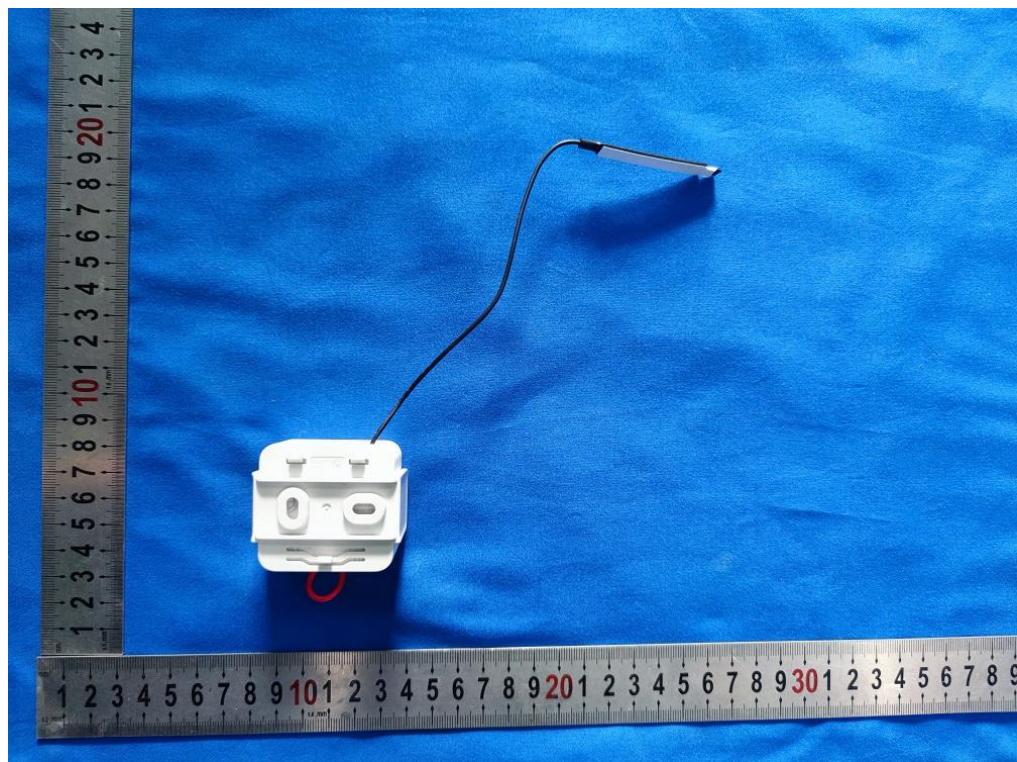


Photo 2: General view

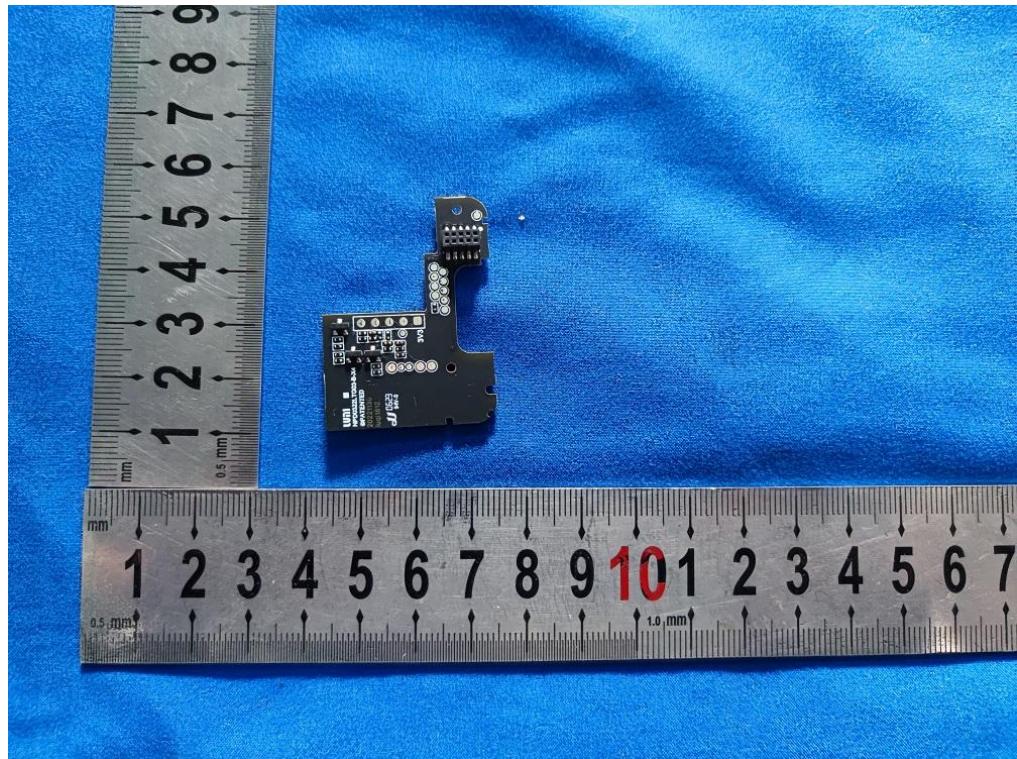


Photo 3: PCB view

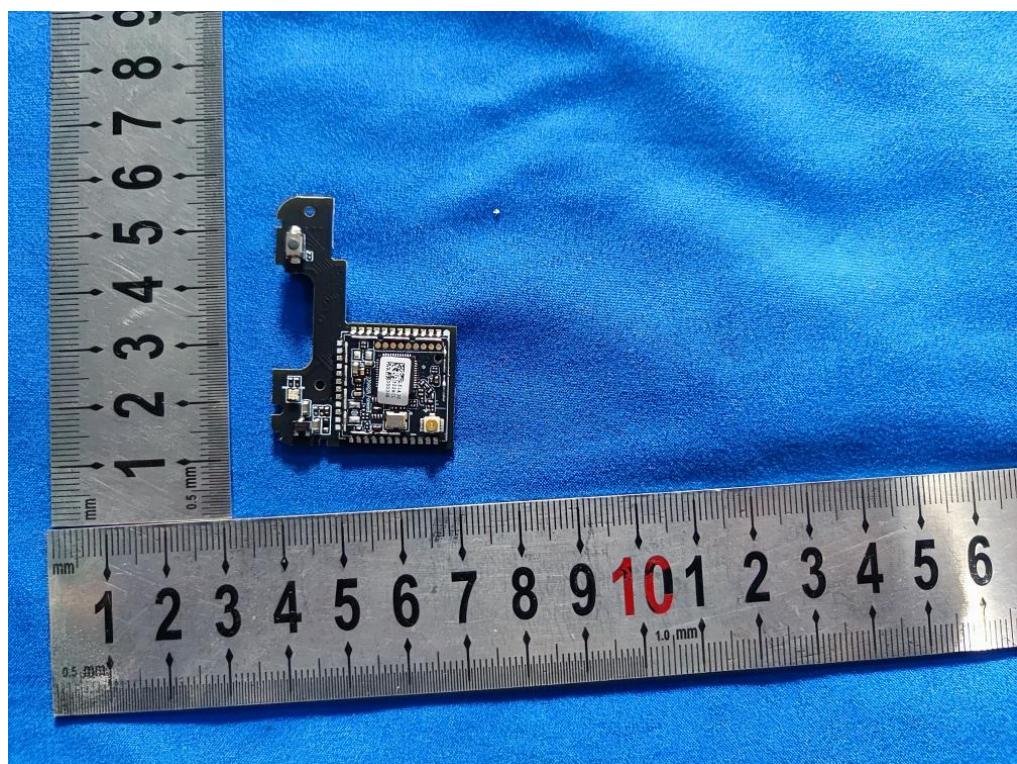


Photo 4: PCB view

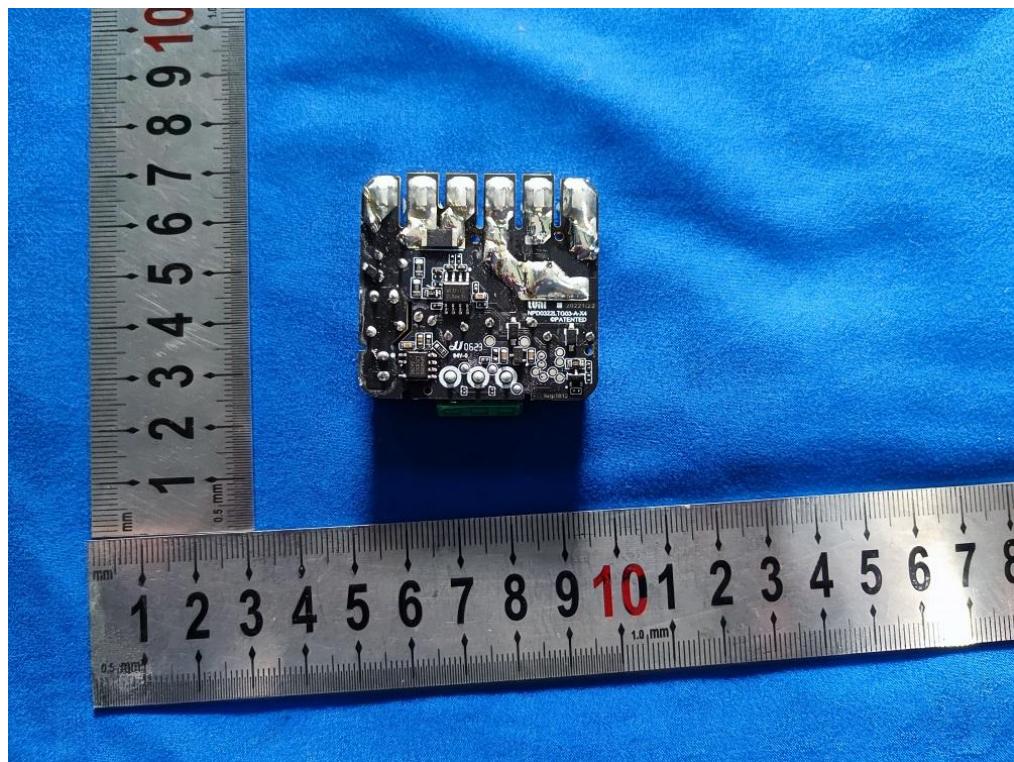


Photo 5: PCB view

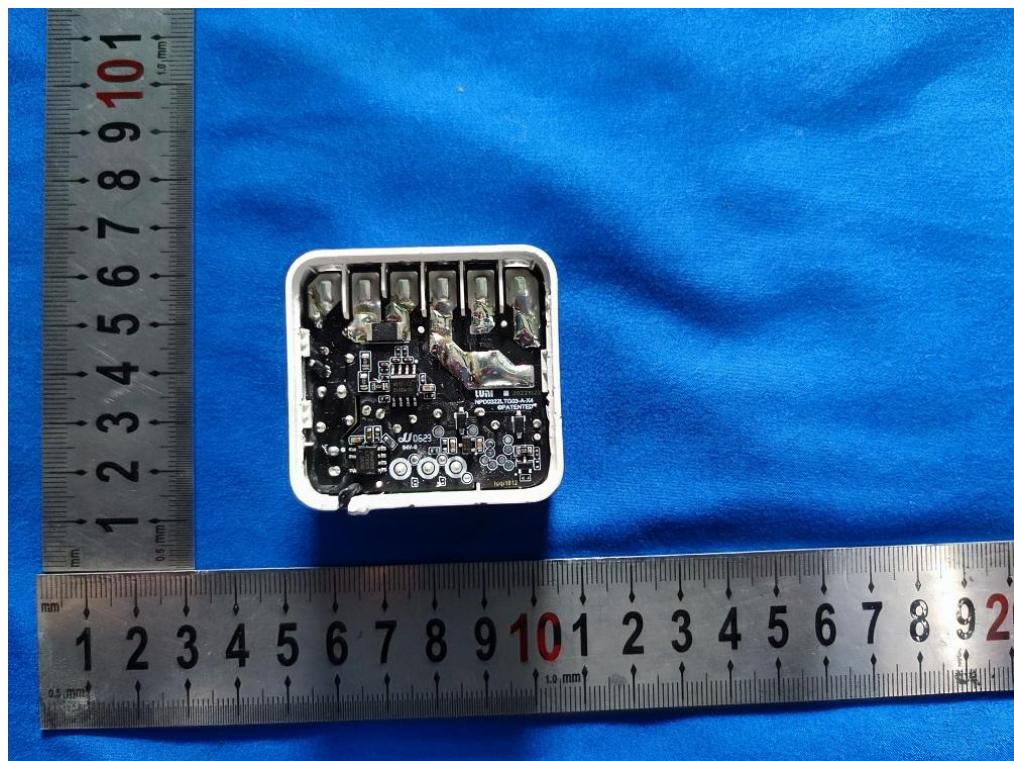


Photo 6: PCB view

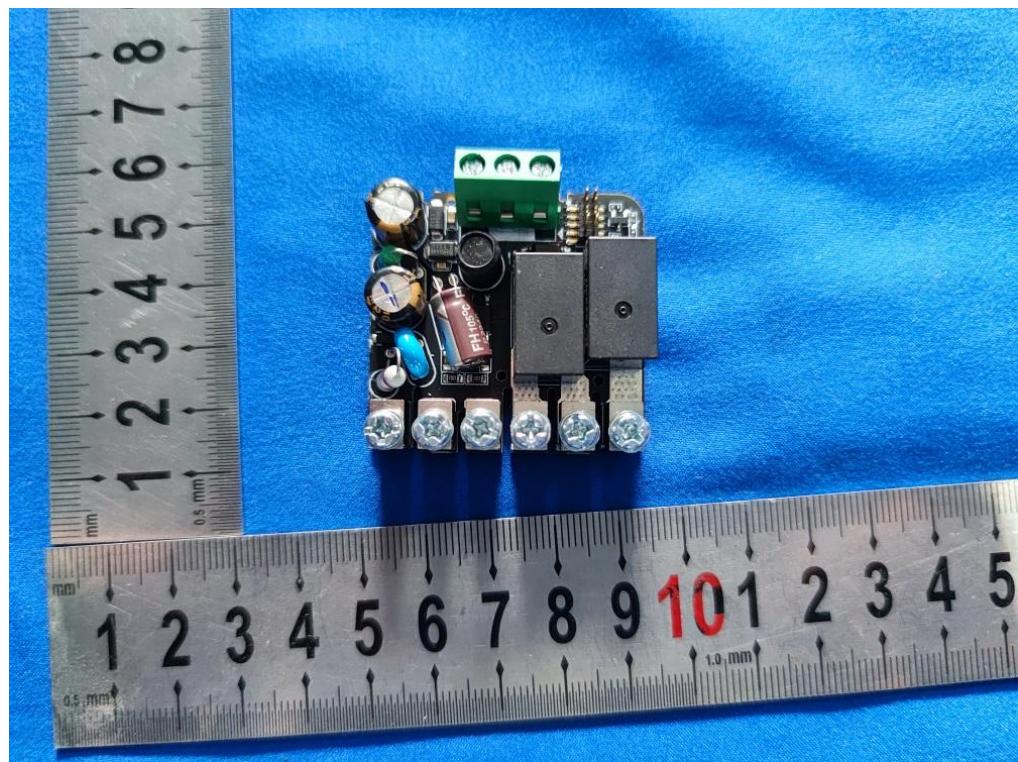


Photo 7: PCB view

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The End

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